

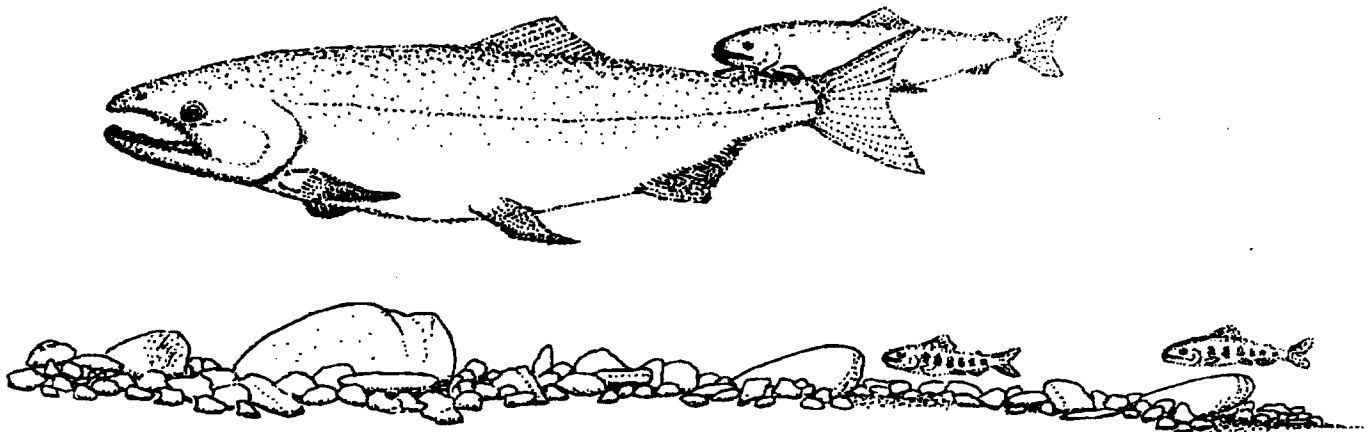


Broodyear Report for Olympic Peninsula National Fish Hatcheries:

Broods Completed 1995-1996

Western Washington Office
Aquatic Resources Division

Lacey, Washington
April 1999



BROODYEAR REPORT
FOR OLYMPIC PENINSULA
NATIONAL FISH HATCHERIES:
BROODS COMPLETED IN 1995-96

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Aquatic Resources Division

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Introduction

This report presents data for Olympic Peninsula National Fish Hatchery (NFH) broods completing their life cycles in the fall of 1995 and winter of 1995-96. Information from the adults creating the brood, egg production, rearing and release, survival to fisheries, and spawning escapement is presented on a broodyear basis. This report is intended to provide a single-broodyear "snapshot" of stock performance. In-depth analyses of trends and possible causes of results are addressed by comprehensive analytical reports that use these broodyear reports as components. Broodyear reports are one of three products specified as action elements under the hatchery evaluation component of the Region One, U.S. Fish and Wildlife Service, Fisheries Vision Action Plan.

The stocks and broods included in this report are:

Hatchery	Species	Brood
Makah NFH	Fall Chinook	1989
	Coho	1992
	Winter Steelhead	1990
	Fall Chum	1990
Quilcene NFH	Spring Chinook	1989
	Coho	1992
	Fall Chum	1990
	Summer Chum	1990
Quinault NFH	Fall Chinook	1989
	Coho	1992
	Winter Steelhead	1990
	Fall Chum	1990

The report details are presented chronologically in the following sections, from spawning through adult return. If a section is missing for a given stock, those data were not collected, or are not available.

- Run timing - adult entry, including total counted, date range, and median date of entry.
- Rack disposition - disposition of the returning fish comprising the brood.
- Spawned fish data - mean age, mean length, sex ratio, spawning date range, and median spawning date.
- Incubation - number of eggs spawned, green eggs per female spawned, number of eggs eyed, percent of green eggs eyed, number of eggs hatched, and percent of green eggs hatched.
- Release and Transfer - locations, last date of release or transfer, fish size at release or transfer, number of fish, life history stage, and associated tagcodes.
- Contribution estimates to fisheries and escapement, from coded-wire-tagging - number of fish, percent total survival, ratio of catch to escapement, and ratio of sport catch to commercial catch. Contribution estimates reflect the total station production.
- Rack return for the surviving brood - number returning to the hatchery by age, and mean length at age.
- Estimated origin of returning coho adults:
Coho are coded-wire-tagged at all three hatcheries, and adults return predominately as a single age class, so the number of returning adults of known hatchery origin can be estimated. Fish of other origins can be accounted for by their most likely possible origins. These origins may include; statistical error in coded-wire tag data expansion, straying from other systems, natural spawning of hatchery or natural fish below the hatchery, and natural spawning of hatchery or natural fish which may have passed above the hatchery intentionally or unintentionally.

Contribution information was generated from the coastwide coded-wire tag release and recovery data maintained by the Pacific States Marine Fisheries Commission in Gladstone, Oregon. Data used in this report were obtained March 1, 1999. The balance of the information in this report came from the Fisheries Resources Evaluation Database (FRED), maintained at the Western Washington Fishery Resource Office, Lacey, Washington. All lengths are reported in millimeters and all weights are reported in grams.

Fish counted as rack returns at all three hatcheries may have originated from hatchery releases or

from natural spawning below or above the hatchery. Likewise, returning adult hatchery fish may not enter the hatchery, but may contribute to natural spawning. Thus, the number of fish shown as returned to the rack may not completely represent hatchery escapement. Quinault NFH fall chinook numbers reported here result from both rack entry and broodstock collection efforts conducted in the mainstem Quinault River. Quilcene NFH summer chum numbers presented here are from fish that originated from natural spawning.

Anomalies to the maximum age at return can have a minor influence on the reported data. Occasionally a four-year-old coho may be recovered or a seven-year-old chinook may be recovered. In the interest of timely reporting of results, those anomalies are not included in this report. Maximum ages used for this report are: coho - three years, chinook - six years, fall chum - five years, and winter steelhead - five years.

CONTRIBUTION SUMMARY

Hatchery	Species	Broodyear	Hatchery escapement	Catch	Total	Total survival
Makah	Fall Chinook	1989	3,246	2,247	5,493	0.52%
Quinault	Fall Chinook	1989	90	1,879	1,969	0.34%
Quilcene	Spring Chinook	1989	28	18	46	0.02%
Makah	Coho	1992	7,295	10,176	17,471	5.82%
Makah	Coho, transfer	1992	606	4,257	4,863	8.17%
Quilcene	Coho	1992	12,244	8,817	21,061	5.25%
Quilcene	Coho, transfer	1992	914	3,940	4,854	3.07%
Quinault	Coho	1992	3,152	4,604	7,756	1.33%
Makah	Winter Steelhead	1990	362	3,189	3,551	4.25%
Quinault	Winter Steelhead	1990	2,128	1,851	3,979	2.17%
Quilcene	Fall Chum	1990	14,430	14,031	28,461	1.71%
Quinault	Fall Chum	1990	1,929	n/a		

Quinault fall chinook survival was below the long-term average of 0.80%.

Quilcene spring chinook total survival was below the 0.058% hatchery return level required for brood maintenance. Continued low survival rates for this program led to its termination in 1993.

Quinault steelhead survival was above average. Recreational fisheries on the Quinault Reservation are not sampled so total survival is greater than the figure reported here.

Quilcene chum were partitioned in the fishery using genetic stock identification by the Washington Department of Fish and Wildlife. The survival estimate is a crude calculation based only on hatchery escapement.

Quinault chum are not coded-wire tagged, nor are fisheries sampled for genetic stock identification, so separation of hatchery and natural components within the catch is not possible.

QUILCENE NFH COHO Broodyear 1992

Run timing

2,721 fish counted at entry Entry date range: 08/03/92 to 12/14/92 Median date: 9/18/92

Rack disposition, parents

Usage	Males	Females	Jacks	Unknown	Total	Percent
Spawned	527	529	44	0	1,100	38%
Surplus	675	652	215	168	1,710	59%
Dead in pond	27	40	1	0	68	2%
Bad females	0	1	0	0	1	0%
Green females	0	6	0	0	6	0%
Total	1,229	1,228	260	168	2,885	

Spawned fish

	Mean age (n)		Mean fork length (n)	
Jacks	2.0	(44)	381	(2)
Males	3.0	(527)	529	(119)
Females	3.0	(529)	537	(130)
Total	3.0	(1,100)	530	(252)

Males : Females: Jacks
 Spawned fish 48% : 48% : 4%
 Spawning date range: 9/ 2/92 to 12/14/92 Median date: 10/18/92

Incubation

Eggs taken = 915,231 1,730 eggs per female
 Eggs eyed = 663,861(72.5%) Eggs hatched = 663,861(72.5%)

Release and transfer

Release site	Final date	g/fish	Number	Tagcodes
Big Quilcene River	04/01/93	0.8	24,500	subyearling
Quilcene NFH	05/09/94	22.6	400,699	yearling
			425,199	053418,053419,053420
Transfer site				
Port Gamble pens	03/16/94	18.2	89,495	pre-smolt
Port Gamble pens	04/21/94	17.5	68,123	pre-smolt
			157,618	212334

Contribution estimates, NFH release, from coded-wire tagging

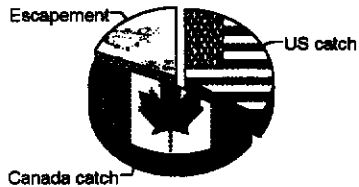
Tagcode	Hatchery	Sport fisheries				Commercial fisheries				Total survival
		WA	Canada	AK	OR	WA	Canada	AK	OR	
053418	3,824	102	34	0	0	512	2,748	0	0	5.43%
053419	4,093	119	68	0	0	747	1,715	0	0	4.94%
053420	4,327	88	0	0	0	675	2,009	0	0	5.41%
	12,244	309	102	0	0	1,934	6,472	0	0	5.25%



Total catch = 8,817
 Catch:Escapement = 1:1.4
 Sport:Commercial = 1:20

Contribution estimates, netpen transfer, from coded-wire tagging

Tagcode	Hatchery	Sport fisheries				Commercial fisheries				Total
		WA	Canada	AK	OR	WA	Canada	AK	OR	survival
212334	914	104	254	0	0	1,550	2,032	0	0	3.07%



Total catch = 3,940
 Catch:Escapement = 4.3:1
 Sport:Commercial = 1:10

Rack return, progeny

Return year	Age	Number to rack	Mean length
1994	2	263	329
1995	3	15,998	581
	3.0	16,261	577

Estimated origin of adults processed at rack

Origin	1995 returning adults
Quilcene NFH	12,176
Local net pens, strays	496
Fry release, natural production, estimation error	3,326
Total	15,998

QUILCENE NFH SPRING CHINOOK Broodyear 1989

Run timing

121 fish counted at entry Entry date range: 05/11/89 to 09/26/89 Median date: 7/21/89

Rack disposition, parents

Usage	Males	Females	Jacks	Total	Percent
Unknown	2	0	0	2	2%
Spawned	32	32	0	64	51%
Surplus	28	0	1	29	23%
Passed over rack	1	0	0	1	1%
Dead in pond	22	7	0	29	23%
Total	85	39	1	125	

Spawned fish

	Mean age (n)	Mean fork length (n)
Males	3.6 (32)	648 (32)
Females	4.6 (27)	769 (32)
Total	4.1 (59)	709 (64)

Males : Females: Jacks

50% : 50% : 0%

Spawning date range: 8/29/89 to 10/ 3/89 Median date: 9/13/89

Release and transfer

Release site	Final date	g/fish	Number	Tagcodes
Quilcene NFH	05/13/91	53.4	229,079 yearling	052357,052358,052359,052360,052361,052362, 052363,052405,052406,052407,052408,052409, 052410,052411,052448,052449
<u>Transfer site</u>				
Quilcene NFH	05/08/90	2.6	68,636	received from Solduc Hatchery

Contribution estimates, from coded-wire tagging

Tagcode	Hatchery	Sport fisheries				Commercial fisheries				Total
		WA	Canada	AK	OR	WA	Canada	AK	OR	survival
Quilcene stock										
052405	5	0	0	0	0	0	0	0	0	0.05%
052406	2	0	0	0	0	0	0	0	0	0.02%
052407	0	0	0	0	0	2	0	1	0	0.03%
052408	0	0	0	0	0	0	0	0	0	0.00%
052409	1	0	0	0	0	0	0	0	0	0.01%
052410	10	5	0	0	0	0	0	0	0	0.17%
052411	8	4	0	0	0	0	0	0	0	0.10%
Solduc stock										
052357	0	0	0	0	0	0	0	0	0	0.00%
052358	0	0	0	0	0	0	0	0	0	0.00%
052359	0	0	0	0	0	0	0	0	0	0.00%
052360	0	0	0	0	0	0	0	0	0	0.00%
052361	0	0	0	0	0	0	0	2	0	0.01%
052362	0	0	0	0	0	0	0	0	0	0.00%
052363	0	0	0	0	0	0	0	0	0	0.00%
052448	2	0	0	0	0	0	4	0	0	0.03%
052449	0	0	0	0	0	0	0	0	0	0.00%
	28	9	0	0	0	2	4	3	0	0.02%



Total catch = 18
 Catch:Escapement = 1:1.6
 Sport:Commercial = 1:1

Rack return, progeny, age estimated from scale samples (may include natural origin fish)

Return year	Age	Number to rack	Mean length
1992	3	6	480
1993	4	3	619
1994	5	5	755
	3.9	14	608

QUILCENE NFH SUMMER CHUM Broodyear 1990

Rack handlings (from hatchery rack and broodstocking in Quilcene River and Quilcene Bay)

Return year	Age	Number processed	Mean length
1993	3	2	488
1994	4	22	672
	3.9	24	656

QUILCENE NFH FALL CHUM Broodyear 1990

Run timing

1,622 fish counted at entry Entry date range: 11/28/90 to 12/27/90 Median date: 12/ 8/90

Rack disposition, parents

Usage	Males	Females	Total	Percent
Spawned	781	834	1,615	99%
Surplus	1	0	1	0%
Bad females	0	4	4	0%
Green females	0	4	4	0%
Total	782	842	1,624	

Spawned fish

	Mean age (n)	Mean fork length (n)
Males	4.0 (239)	705 (130)
Females	3.9 (245)	660 (130)
Total	4.0 (484)	682 (260)

Males : Females: Jacks
 Spawned fish 48% : 52% : 0%
 Spawning date range: 11/28/90 to 12/27/90 Median date: 12/ 8/90

Incubation

Eggs taken = 1,949,568 2,338 eggs per female
 Eggs eyed = 1,504,460(77.2%) Eggs hatched = 1,504,450(77.2%)

Release and transfer

Release site	Final date	g/fish	Number
Quilcene NFH	05/06/91	0.7	1,664,227 fry

Transfer site			
Quilcene NFH	02/06/91	eggs	353,500 received from Enetai Hatchery

Rack return, progeny, age estimated from scale samples (may include natural origin fish)

Return year	Age	Number to rack	Mean length
1993	3	2,673	612
1994	4	11,166	705
1995	5	591	770
	3.9	14,430	690

MAKAH NFH COHO Broodyear 1992

Run timing

4,839 fish counted at entry Entry date range: 09/24/92 to 01/26/93 Median date: 10/25/92

Rack disposition, parents

Usage	Males	Females	Jacks	Total	Percent
Spawned	287	303	5	595	12%
Surplus	777	683	81	1,541	32%
Passed over rack	1,170	1,235	279	2,684	56%
Dead in pond	2	2	2	6	0%
Total	2,236	2,223	367	4,826	

Spawned fish

	Mean age (n)	Mean fork length (n)
Jacks	2.0 (5)	n/a
Males	3.0 (287)	695 (57)
Females	3.0 (303)	667 (83)
Total	3.0 (595)	678 (140)

Males : Females: Jacks
 Spawned fish 48% : 51% : 1%
 Spawning date range: 11/ 2/92 to 1/ 9/92 Median date: 11/ 3/92

Incubation

Eggs taken = 863,243 2,849 eggs per female

Eggs eyed = 723,102 (83.8%)

Release and transfer

Release site	Final date	g/fish	Number	Tagcodes
Waatch River	03/11/93	0.4	75,400	subyearling
Red Creek, Waatch	03/16/93	0.4	60,000	subyearling
Makah NFH	03/16/93	0.4	152,300	subyearling
Makah NFH	04/13/94	33.2	300,380	yearling 053421,053422,053423
			588,080	

Transfer site

Educket Hatchery	03/16/94	26.7	59,500	053136
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Contribution estimates, NFH releases, from coded-wire tagging

Tagcode	Hatchery	Sport fisheries				Commercial fisheries				Total survival
		WA	Canada	AK	OR	WA	Canada	AK	OR	
053421	2,273	184	115	0	0	574	2,938	69	0	6.10%
053422	2,242	203	109	0	0	457	2,358	116	0	5.54%
053423	2,780	310	52	0	0	560	2,087	44	0	5.81%
	7,295	697	276	0	0	1,591	7,383	229	0	5.82%



Total catch = 10,176
 Catch:Escapement = 1.4:1
 Sport:Commercial = 1:9.1

Contribution estimates, Educket transfer, from coded-wire tagging

Tagcode	Hatchery	Sport fisheries				Commercial fisheries				Total
		WA	Canada	AK	OR	WA	Canada	AK	OR	survival
053136	606	258	93	0	0	2,024	1,837	45	0	8.17%



Total catch = 4,257
 Catch:Escapement = 7.0:1
 Sport:Commercial = 1:11.1

Rack return, progeny

Return year	Age	Number to rack	Mean length
1994	2	1,120	371
1995	3	7,530	707
	3.0	8,650	663

Estimated origin of adults processed at rack

Origin	1995 returning adults
Makah NFH	6,794
Educket strays	573
Fry release, natural production, estimation error	163
Total	7,530

MAKAH NFH FALL CHINOOK Broodyear 1989

Run timing

565 fish counted at entry Entry date range: 10/12/89 to 10/30/89 Median date: 10/15/89

Rack disposition, parents

Usage	Males	Females	Jacks	Total	Percent
Spawned	150	254	2	406	71%
Surplus	9	0	145	154	27%
Dead in pond	3	1	1	5	1%
Bad females	0	4	0	4	1%
Total	162	259	148	569	

Spawned fish

	Mean age (n)	Mean fork length (n)
Males	3.0 (126)	818 (149)
Females	4.0 (175)	935 (254)
Jacks	2.0 (2)	403 (2)
Total	4.0 (303)	890 (405)

Males : Females: Jacks
 Spawned fish 37% : 63% : 0.5%
 Spawning date range: 10/12/89 to 10/30/89 Median date: 10/17/89

Incubation

Eggs taken = 1,352,364 5,324 eggs per female
 Eggs eyed = 1,076,685 (79.6%) Eggs hatched = 1,071,574 (79.2%)

Release

Release site	Final date	g/fish	Number	Tagcodes
Makah NFH	05/17/90	6.8	1,066,702 subyearling	051955

Contribution estimates, from coded-wire tagging

Tagcode	Hatchery	Sport fisheries				Commercial fisheries				Total survival
		WA	Canada	AK	OR	WA	Canada	AK	OR	
051955	3,246	0	159	0	0	34	1,589	465	0	0.52%



Total catch = 2,247
 Catch:Escapement = 1:1.45
 Sport:Commercial = 1:12.5

Rack return, progeny (may include natural origin fish)

Return year	Age	Number to rack	Mean length
1991	2	676	473
1992	3	1,106	746
1993	4	2,146	866
1994	5	1,044	927
1995	6	22	932
	3.7	4,994	799

MAKAH NFH WINTER STEELHEAD Broodyear 1990

Run timing

208 fish counted at entry Entry date range: 12/04/89 to 05/01/90 Median date: 1/18/90

Rack disposition, parents

Usage	Males	Females	Total	Percent
Spawned	74	84	158	81%
Surplus	10	24	34	17%
Bad females	0	3	3	2%
Total	84	111	195	

Spawned fish

	Mean age (n)	Mean fork length (n)
Males	3.1 (50)	663 (62)
Females	3.1 (48)	647 (48)
Total	3.1 (98)	656 (110)

Males : Females: Jacks
 Spawned fish 48% : 52% : 0%
 Spawning date range: 1/ 3/90 to 5/ 1/90 Median date: 2/ 1/90

Incubation

Eggs taken = 297,247 3,539 eggs per female
 Eggs eyed = 247,621 (83.3%) Eggs hatched = 215,233(72.4%)

Release and transfer

Release site	Final date	g/fish	Number	
Waatch River	05/22/90	1.5	22,125	subyearling
Makah NFH	05/22/90	1.8	49,905	subyearling
Makah NFH	04/26/91	67.8	83,629	yearling
			155,659	
<u>Transfer site</u>				
Seattle Research	04/11/90	0.4	1,000	
Educket Hatchery	04/15/91	60.5	18,000	
			19,000	

Rack return, progeny

Return year	Age	Number to rack	Mean length
1993	3	266	607
1994	4	93	754
1995	5	3	870
	3.3	362	647

MAKAH NFH CHUM Broodyear 1990**Run timing**

2 fish counted at entry Entry date range: 10/31/90 to 11/26/90 Median date: 11/12/90

Rack disposition, parents

Usage	Males	Females	Total	Percent
Surplus	2	0	2	100%
Total	2	0	2	

QUINULT NFH COHO Broodyear 1992

Run timing

3,500 fish counted at entry Entry date range: 09/22/92 to 02/10/93 Median date: 10/ 7/92

Rack disposition, parents

Usage	Males	Females	Jacks	Total	Percent
Spawned	1,184	1,727	60	2,971	76%
Surplus	251	10	384	645	16%
Dead in pond	97	135	31	263	7%
Bad females	0	2	0	2	0%
Green females	0	12	0	12	0%
Jump out	12	5	5	22	1%
Spawned out	0	1	0	1	0%
Total	1,544	1,892	480	3,916	

Spawned fish

	Mean age (n)		Mean fork length (n)	
Jacks	2.0	(60)	360	(12)
Males	3.0	(1,184)	568	(181)
Females	3.0	(1,727)	606	(244)
Total	3.0	(2,971)	584	(437)

Males : Females: Jacks
 Spawned fish 40% : 58% : 2%
 Spawning date range: 10/ 7/92 to 12/24/92 Median date: 10/28/92

Incubation

Eggs taken = 3,443,306 1,994 eggs per female

Eggs eyed = 2,577,400(74.9%)

Release

Release site	Final date	g/fish	Number	Tagcodes
Quinault NFH	04/12/94	23.2	582,133 yearling	053137,053138,053139

Contribution estimates, from coded-wire tagging

Tagcode	Hatchery	Sport fisheries				Commercial fisheries				Total survival
		WA	Canada	AK	OR	WA	Canada	AK	OR	
053137	1,448	78	0	0	0	615	962	0	0	1.60%
053138	930	83	0	0	0	1,063	498	25	0	1.37%
053139	774	93	0	0	0	892	295	0	0	1.03%
	3,152	254	0	0	0	2,570	1,755	25	0	1.33%



Total catch = 4,604
 Catch:Escapement = 1.46:1
 Sport:Commercial = 1:16.7

Rack return, progeny

Return year	Age	Number to rack	Mean length
1994	2	115	354
1995	3	3,885	612
	3.0	4,000	605

Estimated origin of adults processed at rack

Origin	1995 returning adults
Quinault NFH	3,091
Tagged strays	0
Fry release, natural production, estimation error	794
Total	3,885

QUINULT NFH FALL CHINOOK Broodyear 1989

Rack disposition, parents, hatchery rack and broodstocked

Usage	Males	Females	Jacks	Total	Percent
Spawned	133	229	0	362	75%
Surplus	7	1	20	28	6%
Dead in pond	47	28	1	76	16%
Bad females	0	2	0	2	0%
Green females	0	4	0	4	1%
Jump out	6	2	0	8	2%
Spawned out	0	5	0	5	1%
Total	193	271	21	485	

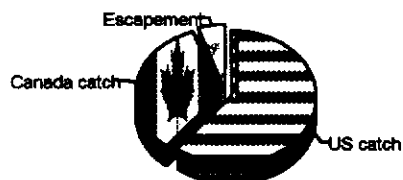
Males : Females: Jacks
 Spawned fish 37% : 63% : 0%

Release and transfer

Release site	Final date	g/fish	Number	Tagcodes
Quinault NFH	07/16/90	7.2	579,332	subyearling 211834
<u>Transfer site</u>				
Salmon River, QDNR	07/03/90	4.9	246,509	

Contribution estimates, from coded-wire tagging

Tagcode	Hatchery	Sport fisheries				Commercial fisheries				Total
		WA	Canada	AK	OR	WA	Canada	AK	OR	survival
211834	90	0	31	0	0	1,038	562	248	0	0.34%



Total catch = 1,879
 Catch:Escapement = 20.9:1
 Sport:Commercial = 1:50

Rack and broodstocked return, progeny (does include natural origin fish)

Return year	Age	Number of fish	Mean length
1991	2	13	456
1992	3	26	651
1993	4	51	842
1994	5	163	949
1995	6	2	980
	4.5	255	873

QUINULT NFH WINTER STEELHEAD Broodyear 1990

Rack disposition, parents

Usage	Males	Females	Total	Percent
Spawned	330	366	696	84%
Surplus	110	2	112	14%
Dead in pond	0	3	3	0%
Bad females	1	4	5	1%
Green females	0	7	7	1%
Jump out	1	0	1	0%
Spawned out	0	4	4	0%
Total	442	386	828	

Spawned fish Males : Females: Jacks
 47% : 53% : 0%

Release and transfer

Release site	Final date	g/fish	Number	Tagcodes
Hoh River	05/10/91	74.4	49,323	yearling 211906
Quinault NFH	05/02/91	76.9	175,463	yearling 052412,052413
			224,786	
<u>Transfer site</u>				
Shelton SFH	05/22/90	1.0	99,894	
Wishkah Ponds	08/01/90	4.6	190,526	
Salmon River, QDNR	02/15/91	29.9	142,443	
Chalaat Creek,Hoh	02/27/91	47.8	50,894	
			483,757	

Contribution estimates, from coded-wire tagging

Tagcode	Hatchery	Sport fisheries				Commercial fisheries				Total survival
		WA	Canada	AK	OR	WA	Canada	AK	OR	
211906	69	0	0	0	0	100	0	0	0	0.34%
052412	911	0	0	0	0	732	0	0	0	1.92%
052413	1,148	0	0	0	0	1,019	0	0	0	2.41%
	2,128	0	0	0	0	1,851	0	0	0	2.17%

Total catch = 1,851

Catch:Escapement = 1:1.15

Sport:Commercial = n/a

Rack return, progeny (may include natural origin fish)

Return year	Age	Number to rack	Mean length
1992	2	13	401
1993	3	1,761	617
1994	4	491	764
1995	5	29	856
	3	2,294	650

QUINALT NFH FALL CHUM Broodyear 1990

Rack disposition, parents

Usage	Males	Females	Total	Percent
Spawned	352	467	819	53%
Dead in pond	442	264	706	46%
Bad females	0	7	7	0%
Green females	0	4	4	0%
Spawned out	0	6	6	0%
Total	794	748	1,542	

Spawned fish

	Mean age (n)	Mean fork length (n)
Males	3.9 (102)	766 (124)
Females	4.0 (160)	690 (153)
Total	3.9 (262)	724 (277)

Males : Females: Jacks
 Spawned fish 43% : 57% : 0%
 Spawning date range: 10/29/90 to 11/27/90 Median date: 11/12/90

Incubation

Eggs taken = 1,030,546 2,207 eggs per female
 Eggs eyed = 1,003,807(97.4%) Eggs hatched = 1,003,757(97.4%)

Release

Release site	Final date	g/fish	Number
Quinalt NFH	04/25/91	1.3	995,567 fry

Rack return, progeny (may include natural origin fish)

Return year	Age	Number to rack	Mean length
1993	3	127	628
1994	4	1,623	721
1995	5	179	771
	4.0	1,929	720